

PROCEEDINGS

OF

THE ROYAL SOCIETY.

June 2, 1892.

The Annual Meeting for the Election of Fellows was held this day

The LORD KELVIN, D.C.L., LL.D., President, in the Chair.

The Statutes relating to the election of Fellows having been read, General Clerk and Mr. Crookes were, with the consent of the Society, nominated Scrutators to assist the Secretaries in examining the lists.

The votes of the Fellows present were then collected, and the following candidates were declared duly elected into the Society :—

Armstrong, Robert Young, Lieut.- Col. R.E.	Herdman, Professor William Abbott, D.Sc.
Beddard, Frank Evers, M.A.	Hutton, Capt. Frederick Wollas- ton.
Fleming, Professor John Ambrose, D.Sc.	Joly, John, M.A.
Foster, Professor Clement Le Neve, D.Sc.	Larmor, Joseph, D.Sc.
Gadow, Hans, M.A., Ph.D.	Miall, Professor Louis C.
Giffen, Robert, LL.D.	Peach, Benjamin Neve, F.R.S.E.
Gotch, Professor Francis, M.A., M.R.C.S.	Pedler, Professor Alexander, F.I.C.
	Waller, Augustus D., M.D.

Thanks were given to the Scrutators.

June 2, 1892.

The LORD KELVIN, D.C.L., LL.D., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read :—

VOL. LII.

B

I. "On the Method of Examination of Photographic Objectives at the Kew Observatory." By Major L. DARWIN. Communicated by Captain ABNEY, R.E., F.R.S. Received April 13, 1892.

(Abstract.)

The paper describes the method of examination of photographic objectives which has been adopted at the Kew Observatory, chiefly on the recommendation of the author. In selecting and devising the different tests, Major Darwin acted in co-operation with Mr. Whipple, the Superintendent of the Observatory, and was aided by consultations with Captain Abney.

The object of the examination is to enable any one, on the payment of a small fee, to obtain an authoritative statement or certificate as to the quality of an objective for ordinary purposes; the amount of time that can be devoted to each experiment is therefore strictly limited.

An example is first given of a "Certificate of Examination" such as would be obtained from Kew, and then the different tests are discussed in detail. Many of them are done by well-known methods, which need not here be mentioned. For the greater part of the examination, an apparatus called the "testing camera" is employed, and this is fully described in the paper. The following are the different items in the Certificate of Examination, including the various tests to which the objective is subjected, or the subjects about which information is given:—

(1.) to (4.) Under these headings are given a description of the objective, the date of receipt, the size of the plate for which the objective is to be examined, &c., &c. None of this information forms part of the result of the testing.

(5.) *Number of Reflecting Surfaces of the Lenses.*

(6.) *Centering in Mount.*

(7.) *Visible Defects, such as Veins, Feathers, &c.*

(8.) *Flare Spot.*

(9.) *Effective Aperture of Stops*, which is given for each one supplied with the objective. In recording the results, it is proposed that the system of numbering recommended by the International Photographic Congress of Paris of 1889 should be adopted.

(10.) *Angle of Cone of Illumination, &c.*—Under this heading several useful items of information are given, such as the extreme angle of the field which is illuminated by the objective without reference to definition; the angle of field which is required to cover the plate of the size for which the objective is being examined; and, the largest stop of which the whole opening can be seen from the

whole of the plate. With reference to this last item, it is shown how if a larger stop than the one here named is used, the illumination will fall off very rapidly towards the edges of the plate, whereas there will be no improvement in this respect by using a smaller stop.

(11.) *Principal Focal Length.*—This is found by revolving the camera through a known angle, and measuring the movement of the image of a distant object on the ground glass; with the testing camera it is so arranged that an angular movement can be given with great ease and accuracy, and that the angle is such that half the focal length is directly read off on a scale on the ground glass. The observation is made, and the focus adjusted, when the image is at a point some 14 degrees from the axis of the objective, and the effect of distortion and curvature of the field is discussed; it is proved that the focal length thus obtained, even though it may not be identical with the principal focal length as measured on the axis, is nevertheless what the photographer in reality wants to ascertain.

(12.) *Curvature of the Field.*—The amount of movement of the ground glass to adjust the focus at different parts of the field is measured, and the results are recorded to show the curvature. A table is given by which it can be seen what is the largest stop which can be used so as to produce negatives up to a certain standard of excellence in definition.

(13.) *Distortion.*—This test depends in principle on ascertaining the sagitta or deflection in the image of a straight line along one side of the plate. In the discussion it is shown that to give the total distortion near the edge of the plate would not answer practical requirements, and that the proposed method of examination does give the most useful information that can be supplied.

(14.) *Definition.*—This is found by ascertaining what is the thinnest black line the image of which is just visible when seen against a bright back-ground. It is shown that this is the best method that could be devised of measuring the defining power of an objective, and that it is not open to serious objections on theoretical grounds.

(15.) *Achromatism.*—Under this heading is recorded the difference of focus between an object when seen in white light and the same when seen in blue or red light. How to estimate approximately the diffusion in the image due to any defect in achromatism is discussed.

(16.) *Astigmatism.*—This test is performed by measuring the distance between the focal lines at the corner of the plate, and by calculating from the result thus obtained the approximate diameter of the disc of diffusion due to astigmatism. The reflection of a lamp in a thermometer bulb is employed to give a fine point of light, and the positions of the focal lines are obtained by noting when the image of the object appears as a fine line, first in one direction, and then in another, as the focus is altered.

(17.) *Illumination of the Field.*—The method of examination, which is due to Captain Abney, is described. The question of the falling off of the intensity of illumination from the centre of the plate is discussed.

II. "Supplementary Report on Explorations of Erect Trees containing Animal Remains in the Coal-Formation of Nova Scotia." By Sir J. WILLIAM DAWSON, F.R.S. Received April 25, 1892.

To the memoir which I had the honour to present to the Royal Society on this subject in 1882* I appended a note from Dr. Scudder, of Cambridge, U.S., so well known for his researches in fossil Insects and Arachnidans, in which he gave a preliminary account of the remains of Arthropods in my collections which I had submitted to him. He has only in the present year completed his examination of these remains, most of which are very fragmentary, and much damaged by unequal pressure. The result has been embodied in a Report on Canadian Fossil Insects, now in course of publication by the Geological Survey of Canada.

In this report he will describe from the contents of the Sigillarian stumps extracted by me, with the aid of the grant of this Society, three new species of Myriapoda, making, with the five previously known from these remarkable repositories, eight in all, belonging to two families, Archiulidæ and Euphoberidæ, and to three genera, *Archiulus*, *Xylobius*, and *Amynilyspes*. The three new species are *Archiulus euphoberioides*, Sc., *A. Lyelli*, Sc., and *Amynilyspes* (sp.). The remains of Scorpions he refers to three species, *Mazonia acadica*, Sc., *Mazonia* (sp.), and a third represented only by small fragments. The characters of the species referred to *Mazonia* he considers as tending to establish the generic distinctness of *Mazonia* from *Eoscorpious*. Dr. Scudder also notices the fragment of an insect's head containing part of a faceted eye, mentioned in my memoir, and considers it probably a portion of a Cockroach.

Much credit is due to Dr. Scudder for the care and skill with which he has worked up the mostly small and obscure fragments which I was able to submit to him, and which are probably little more than *débris* of the food of the Amphibians living for a time in these hollow stumps, and devouring such smaller animals as were so unfortunate as to be imprisoned with them. In this connexion the suggestion of Dr. Scudder is worthy of attention, that the scaly armour of the smaller Microsaurians may have been intended to defend them against the active and venomous Scorpions which were their contemporaries, and some of which were sufficiently large to

* 'Phil. Trans.,' 1882, p. 621.